Name: Wirth, John
Education Institution: University of Illinois at Urbana-Champaign
Major/Degree/Grad Year: Aerospace Engineering/BS 2012
NASA MSFC Mentor: Michael Kovach and Jason Campbell
Org Code: JP 20 and ER 51

Research and Experience

- **Wirth Farms,** *General Laborer,* Erie, Illinois (6/00-8/10)
  - Compiled spreadsheets to streamline business cost calculations and record data
  - Maintained facilities and equipment; including rebuilding a snowmobile engine and restoring a motorcycle
  - Planted and harvested approximately 1600 acres of corn and soybeans
- **Wyffels Hybrids,** *Production Assistant,* Atkinson, Illinois (1/06-7/10)
  - Prepared and assembled customers' orders on a daily basis
  - Served as field inspector during detasseling season; reported findings directly to field foreman
  - Managed inventory transactions and entered customer data using proprietary software
- **John Deere,** *Production Control Assistant,* Moline, Illinois (2/08-9/08)
  - Identified obsolete inventory that was wasting available floor space in factory
  - Collected inventory audits to reflect actual quantities using company proprietary software
  - Assisted in scheduling the daily production plan as needed

Membership and Activities

- Illinois Space Society, *Technical Project Committee Member/Educational Outreach Member* (8/09-Present)
  - Built a solid fuel rocket that flew to 8,760 feet and flew at supersonic speeds
  - Help plan events to educate young students about rocketry and science
  - Collaborated with other committee members to discuss ideas and operate together to build rockets
- American Institute of Aeronautics and Astronautics, *Member,* (8/09-Present)

Honors and Awards

- Member of Phi Sigma Theta National Honor Society

Title of Poster: Small Launch Vehicle Design Optimization

Abstract: Currently, small satellites (nanosats) can be included as secondary payloads in large launch vehicles housing much larger primary payloads. In an interest to minimize the complexity associated with having multiple payloads and to increase the chance of successful payload deployment into orbit; the use of smaller launch vehicles specifically designed for these small satellites is preferential. Pursuant to minimizing the cost per mass of payload to low earth orbit, it is desired that the launch vehicle mass can be minimal (optimized) at liftoff. Options to consider in the design of the launch vehicles include the type of propulsion systems utilized, the number of stages used, and the materials selection which will affect the inert mass fraction. A code was developed that used a modified form of the ideal rocket equation to calculate the gross liftoff mass of a two-stage launch vehicle. Parameters such as payload mass, total velocity required to reach orbit, specific impulse of each stage, and the propellant mass fraction of each stage are input into the code. A plot showing the initial vehicle mass versus the fraction of the total velocity produced by the first stage is then generated. The minimum mass obtainable with the given configuration is also displayed in the output. However, this code only provides a rough estimate of the vehicle mass since it uses the ideal rocket equation. Gravity losses, steering losses, and drag losses are not accurately included in the calculations. Therefore, to mitigate these concerns, a higher total velocity needed to reach orbit was initially assumed in an interest to prevent a calculation that would undersize the actual size of the launch vehicle needed to reach orbit. Future work would include expanding the code to consider the above velocity losses in detail and for launch vehicles having more than two stages so that an answer with higher fidelity can be determined.